Sink or Float?

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About **Sink or Float?**

DeltaScienceModules, THIRD EDITION

Students are on a mission to answer the title question, Sink or Float? And they find that the answer is, "It depends." First, students discover and define *buoyancy* and *surface tension*. They use the experimental method to find out what factors (including material, size, shape, density, and kind of liquid) affect buoyancy and how. Then they give their Sink or Float knowledge a practical application. They test the capacity of vessels of various shapes, sizes, and materials to arrive at an understanding of what makes a good boat. The unit concludes with a cargo contest. Student master builders design and construct boats to see whose can carry the most cargo—without sinking!

In the Delta Science Reader *Sink or Float?* students explore why different objects sink or float. They read about the concept of buoyancy. They find out about matter and the tiny atoms that make up everything. They learn about the physical properties of solids, liquids, and gases and discover which properties allow different solids, liquids, and gases to float. Finally, students learn that boat builders use this information to build boats of different sizes and shapes from different types of materials.

Overview Chart for Hands-on Activities

Hands-on Activity	Student Objectives
1 **What Sinks, What Floats?** *page 13*	• predict whether various objects placed in water will sink or float • place the objects in water and observe whether they sink or float • discuss the concept of buoyancy
2 **Same Size, Same Shape** *page 21*	• test the buoyancy of objects made of different materials but having the same shape and size • infer that the type of material an object is made of is one of the factors that determine whether it will sink or float • begin listing on a class chart the factors that determine whether an object will sink or float
3 **Different Size, Same Shape** *page 29*	• investigate whether objects of the same material and shape but of different sizes float or sink • observe that size does not affect the buoyancy of an object • confirm the importance of material as a factor affecting an object's buoyancy
4 **Bubbles and Buoyancy** *page 35*	• observe bubbles rising to the surface of carbonated water • compare the buoyancy of an object submerged in plain water with its buoyancy in bubbling water • conclude that bubbles attached to a submerged object increase its buoyancy • add *bubbles in water* to the Sink or Float? chart as a factor affecting buoyancy
5 **Same Size, Different Shape** *page 43*	• weigh out equal amounts of clay and mold them into various shapes that will float in water • discover that by changing the shape of an object they can change its buoyancy • add *shape of object* to the Sink or Float? chart as a factor affecting buoyancy
6 **Floating Metal** *page 53*	• experiment with a metal object to see if they can make it float • determine what factors contribute to the ability of a metal object to float • add *position on surface* to the Sink or Float? chart as a factor affecting buoyancy
7 **Fresh and Salty** *page 61*	• experiment with floating an object in two different liquids, fresh water and salt water • observe that the buoyancy of an object is different in different liquids • add *type of liquid* to the Sink or Float? chart as a factor affecting buoyancy
8 **Loading a Boat** *page 67*	• make clay boats and load them with various weights • observe and record the maximum amount of cargo their boats can hold • operationally define *capacity* • compare the capacities of different teams' boats
9 **Boats of All Shapes** *page 75*	• formulate hypotheses about how to maximize a boat's capacity • design boats of different shapes and determine their capacities • start a Good Boat chart that lists the factors that determine what makes a good boat
10 **Boats of All Sizes** *page 81*	• predict how size affects capacity • create boats of different sizes but of the same shape and material • conclude that the larger the boat, the larger its capacity • add *large size* to the Good Boat chart as a factor affecting capacity
11 **Boats of Different Materials** *page 89*	• construct a clay boat of the same inside size as a foam-cup boat • compare the weight capacities of clay and foam boats of the same inside size and outside shape • add *buoyant material* to the Good Boat chart as a factor affecting capacity
12 **A Cargo Contest** *page 97*	• design and make boats out of any materials they choose • compare their boats in terms of weight capacity • make drawings of their "ideal" boats
Assessment *page 105*	• See page 105.

Process Skills	Vocabulary	Delta Science Reader
predict, observe, define based on observations	**buoyancy, buoyant, float, prediction, sink**	pages 2, 7–8
predict; observe; compare; infer; collect, record, display, or interpret data	**factor, material, shape, size**	pages 3–4, 7–8, 9–11
compare; observe; infer; collect, record, display, or interpret data		pages 3–4, 7–8, 9–11
predict; observe; compare; infer; collect, record, display, or interpret data		page 15
measure; compare; use numbers; use variables; collect, record, display, or interpret data	**balance, gram, weight**	pages 3–4, 7–8, 9–11
predict; experiment; observe; define based on observations; collect, record, display, or interpret data	**metal, surface tension**	pages 5, 9–11
predict; experiment; use variables; compare; infer; collect, record, display, or interpret data		pages 6, 14
predict; hypothesize; experiment; collect, record, display, or interpret data	**boat, capacity, cargo**	pages 9–11, 12–13
predict; observe; infer; collect, record, display, or interpret data	**hull**	pages 7–8, 9–11, 12–13
predict; measure; use numbers; compare; collect, record, display, or interpret data		pages 7–8, 9–11, 12–13
hypothesize; experiment; use variables; infer; collect, record, display, or interpret data		pages 7–8, 9–11, 12–13
use numbers; measure; compare; collect, record, display, or interpret data		pages 12–13

See the following page for the Delta Science Reader Overview Chart.

Overview Chart for Delta Science Reader
Sink or Float?

Selections	Vocabulary	Related Activity
Think About...		
Why Do Some Things Float? *page 2*	**float, sink**	Activity 1
What Is Matter? *page 3*	**atoms, mass, matter, physical property**	Activities 2, 3, 5
What Is a Solid? *page 5*	**solid, state of matter**	Activity 6
What Is a Liquid? *page 6*	**liquid**	Activity 7
What Sinks? What Floats? *page 7*	**buoyancy**	Activities 1, 2, 3, 5, 9, 10, 11
Why Do Boats Float? *page 9*		Activities 2, 3, 5, 6, 8, 9, 10, 11
People in Science		
• **Boat Builders** *page 12*		Activities 8, 9, 10, 11, 12
Did You Know?		
• **A Liquid Can Float** *page 14*		Activity 7
• **A Gas Can Float** *page 15*	**gas**	Activity 4

See pages 113–121 for teaching suggestions for the Delta Science Reader.

MATERIALS LIST

Sink or Float?

Quantity	Description
3	bags, plastic, reclosable*
4	balance bases
4	balance beams, hardboard
4	balance beams, wood
4	balance hardware kits
1	balance instruction sheet
8	balance pans
4	balance posts
8	balls, foam
1	chalk, p/12*
1	chart, Good Boat*
1	chart, Sink or Float?*
8	clay, plasticene, gray, 1 lb*
16	containers, plastic, 1-gal
16	cubes, aluminum, large
16	cubes, aluminum, small
16	cubes, lucite, large
16	cubes, lucite, small
16	cubes, milky plastic, large
16	cubes, milky plastic, small
5	cubes, plastic, 1-g, p/100
16	cubes, wooden, large
16	cubes, wooden, small
17	cups, foam, 8-oz*
8	cups, paper, soufflé, 2-oz*
32	cups, plastic, 1-oz
16	cups, plastic, 12-oz
10	paper clips, large, p/100
1	paper clips, small, p/100
1	plastic wrap*
1	salt, 26 oz*
2	seltzer tablets, p/12*
16	spoons, plastic
1	toothpicks, p/750*
8	washers, metal
32	weights, 25-g
1	**Teacher's Guide**
8	**Delta Science Readers**

Quantity	Description
TEACHER-PROVIDED ITEMS	
16	eggs, hard-boiled*
–	glue
1	knife, dull
1	marker, felt-tip
–	materials, assorted, for "boats"
1	mop (optional)
–	newspaper*
–	objects from nature, assorted, for testing
–	objects, small, for "cargo"
–	paper towels*
16	pennies
1	pliers, needle-nose
16	rulers, metric
16	sandwich bags (optional)
16	scissors, blunt-tip
1	scissors, small, pointed
32	smocks (optional)
–	tape, masking*
–	water, tap*

* = consumable item

† = in separate box

To order consumable items or refill kits, please call 1-800-442-5444.

ACTIVITY SUMMARY

In this Delta Science Module, students are introduced to the concept of buoyancy, which can be defined both as the tendency of an object to float in a liquid as well as the upward force a liquid exerts on an object placed in it.

ACTIVITY 1 Students are introduced to the concepts of floating and sinking. They place various objects in a container of water and compare their degrees of buoyancy—the tendencies of those objects to sink or float.

ACTIVITY 2 Students experiment to determine whether the type of material of which an object is made affects its buoyancy in water. As a class, they begin to list on a Sink or Float? chart the factors that influence buoyancy.

ACTIVITY 3 Students compare cubes of the same shape and the same material but of different sizes. They conclude that size does not affect the buoyancy of an object.

ACTIVITY 4 Students place tiny clay balls in both plain and carbonated water and observe that the balls of clay sink to the bottom in both but that gas bubbles in the carbonated water eventually adhere to the clay balls and lift them to the surface.

ACTIVITY 5 Students continue to experiment with clay, and find that by changing its shape—into a bowl- or boat-shape, for example—they can increase the buoyant force the water exerts on it and make it float.

ACTIVITY 6 Students observe that when they carefully position a paper clip flat on the surface of water, it floats, supported by the water's surface tension.

ACTIVITY 7 Students learn that different liquids have different degrees of buoyancy and that salt water exerts more buoyant force on an object than does plain water.

ACTIVITY 8 Students apply what they have learned about the effect of shape on buoyancy as they design and make clay boats that not only float but can carry the additional weight of cargo without sinking.

ACTIVITY 9 Students determine what makes a "good boat"—that is, a boat that will carry the maximum cargo without sinking. They construct clay boats of different shapes and load them to their maximum capacities. In doing so, students discover which aspects of boat design are most critical.

ACTIVITY 10 Students compare the capacities of boats of different sizes. They use the same material (clay) and a standard shape, but this time each team creates three boats of increasing sizes and tests them with various weights of cargo. Students conclude that the larger the boat, the greater its weight capacity.

ACTIVITY 11 Students determine the effect of the type of material on the capacity of a boat. Each team creates a clay boat of the same internal size and outside shape as a boat made from a foam cup and compares their weight capacities. They conclude that a boat should be made of a buoyant material if it is to carry the maximum cargo for its size and shape.

ACTIVITY 12 Students apply what they have learned in this module by trying to create an "ideal boat." Students choose from a wide selection of boat-building materials and, within a size limit, construct their boats with maximum capacity as their goal. They then compare their boats and discuss the qualities that distinguish the boats that can carry the most cargo.